

# Undergraduate Catalog of Courses

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## Biology

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### BIOLOGY

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The Biology Department offers a full range of courses designed to introduce undergraduate students to the major areas of modern biological science. The primary goals of the department are to prepare students for advanced study and research in biology and related sciences; for postgraduate study in medicine, dentistry, and the other health professions; and for careers in education, industry, agriculture, government service and veterinary medicine. Students interested in the health professions should check the Pre-Professional section of the catalog for additional information.

#### FACULTY

**Vidya Chandrasekaran, Ph.D.**, *Associate Professor, Chair*  
*Developmental Biology, Biochemistry, Genetics*

**James Berleman, Ph.D.**, *Adjunct Assistant Professor*  
*Microbiology, Microbial Ecology, Genetics*

**Carla C. Bossard, Ph.D.**, *Professor Terrestrial Ecology,*  
*Plant Science*

**Lawrence R. Cory, Ph.D.**, *Professor Emeritus Genetics,*  
*Amphibian Biology, Evolutionary Biology*

**Margaret F. Field, Ph.D.**, *Associate Professor Physiology,*  
*Cell Biology*

**Keith E. Garrison, Ph.D.**, *Associate Professor Immunology,*  
*Genetics, Molecular Biology*

**Allan K. Hansell, Ph.D.**, *Professor Emeritus Cell Biology,*  
*Biochemistry, Genetics*

**Rebecca Jabbour, Ph.D.**, *Associate Professor Evolution,*  
*Anatomy*

**Wendy Lacy, Ph.D.**, *Adjunct Associate Professor*  
*Microbiology, Cell Biology, Developmental Biology*

**Phillip Leitner, Ph.D.**, *Professor Emeritus Conservation*  
*Biology, Desert Ecology*

**Jacob F. Lester, Ph.D.**, *Professor Zoology, Parasitology*

**Michael P. Marchetti, Ph.D.**, *Fletcher Jones Professor*  
*of Biology*

**Aquatic Ecology, Conservation Biology, Invasive Species**

**James Pesavanto, Ph.D.**, *Adjunct Assistant Professor*  
*Biochemistry, Molecular Biology*

**Sonya Schuh-Huerta, Ph.D.**, *Assistant Professor Cell*  
*Biology, Developmental Biology, Physiology*

**Gregory R. Smith, M.S.**, *Professor Anatomy, Physiology*

#### LEARNING OUTCOMES

*Students who graduate with a major in biology will be able to:*

- **DEMONSTRATE** a solid knowledge in all three major areas of biology: molecular and cellular, organismal and ecology and evolutionary.
- **ANALYZE** logically and critically scientific information.
- **APPLY** knowledge they have already mastered from current and previous courses to the exploration of new areas of inquiry.
- **COMMUNICATE** skillfully through written and oral reports.
- **USE** biological methodology competently for laboratory research.
- **INTEGRATE** an awareness of ethical issues with their understanding of and work in biology.

#### ADMISSION REQUIREMENTS

Applicants planning to undertake the biology major must present credits for one year of chemistry and four years of mathematics. One course in biology, one year of physics, and three years of a second language are strongly recommended. Students with less than a B average in high school science, mathematics and languages or with any course deficiency should seek the advice of the Admissions Office and the Biology Department before beginning their studies. A diagnostic chemistry examination is required of all students beginning a science curriculum at Saint Mary's. This examination is administered by the Department of Chemistry before the start of classes each fall and is designed to detect important deficiencies in a student's background. In some cases, the student may be advised to correct any deficiencies before undertaking the biology major curriculum. This can often be done within a four-year stay at Saint Mary's but may require summer school attendance.

## MAJOR REQUIREMENTS

### LOWER DIVISION BIOLOGY MAJOR

**Mathematics 27–28** (or equivalent, e.g. **Math 38**)

**Chemistry 8 and 9 (lab); 10 and 11 (lab)**

**Physics 10 and 20 (lab); 11 and 21 (lab), or**

**Physics 1 and 2 (lab); 3 and 4 (lab)**

**Biology 1 and 1L (lab); Biology 2 and 2L (lab)**

*Lower-division requirements for split majors must be determined by consultation between the student and his/her advisor, and approved by the chairs of the departments involved.*

### UPPER DIVISION BIOLOGY MAJOR

**Chemistry 104, 104L, 106, 106L** The biology major must include seven upper-division biology courses, at least five of which must include a laboratory component. To develop a broad background in biology and to experience major areas of study within the disciplines, biology majors are required to take both courses from Group I and at least one course from Groups II, III, and IV. The remainder of the seven required may come from any group.

Group I Genetics and Ecology: **Biology 105, 125**

Group II Organismal: **Biology 100, 102, 110, 113, 122, 127, 128, 144, 146**

Group III Cellular/Molecular: **Biology 130, 132, 135, 137, 139**

Group IV Evolution and Ecology: **Biology 113, 115, 120, 142, 152**

Group V Electives: **Biology 116, 119, 192, 193, 194**

*All split majors with biology as the predominant area must be arranged by petition. They must have a clear emphasis, a direction and show relatedness among the courses chosen. The specific upper-division courses selected for any split major must be arranged between the student and his/her advisor and be approved by the chairs of the departments involved.*

### SUGGESTED BIOLOGY MAJOR PROGRAM

A suggested four-year program of study for a major in biology is available from department faculty. Faculty advisors should be consulted on a regular basis to assist in selecting courses and arranging specific curricula relating to fulfillment of major and core curriculum requirements, as well as particular career goals and personal interests. Students majoring in science should be particularly alert to the language proficiency requirement. Students may select courses of their choice for remaining electives. It is important to note that certain upper-division courses are offered in alternate years.

## MINOR REQUIREMENTS

The minor in biology requires **Chemistry 8 and 9 (lab), 10 and 11 (lab), and Biology 1 and 1L (lab), 2 and 2L (lab).**

Any three upper-division biology courses, two of which must have a laboratory component. Note that all courses have prerequisites. The specific upper-division courses selected for the minor must be arranged between the student and his/her advisor and be approved by the chairs of the departments involved.

### JANUARY TERM

Frequently, faculty members in the Biology Department offer courses during the January Term. Since it is the policy of the department to provide a variety of learning experiences during this term, the following kinds of courses are often offered: (1) Seminars designed to probe special areas of current interest in the biological sciences through readings in the primary literature, preparation of reports and class discussions; (2) Field courses, based either on campus or at a field site, that provide experience in the study of natural ecosystems; (3) Directed research into topics in experimental or field biology of interest to faculty and students; (4) Independent study courses either on campus or by special arrangement at universities or research institutions. It is the general policy of the department that courses taken during the January Term cannot be used to satisfy requirements for the major.

### PREPARATION FOR MEDICINE, DENTISTRY AND OTHER HEALTH PROFESSIONS, AND VETERINARY MEDICINE

See the section in this catalog under Pre-Professional Curricula.

### PREREQUISITE GRADE

*Any course listed in this department with a prerequisite assumes a grade of C– or better in the prerequisite course.*

## C O U R S E S

### LOWER DIVISION

#### 1 Introduction to Cell Biology, Molecular Biology and Biochemistry

This is the first semester of a two-semester sequence designed for biology majors and others requiring a rigorous treatment of the subject. It is designed to prepare students for in-depth, upper-division work in areas related to cell biology, molecular biology, biochemistry and genetics. Three hours of lecture per week. Must be enrolled concurrently in **Biology 1L**. *Prerequisites: Chemistry 8 and 9 (lab), 10 and 11 (lab) with grades of C– or better.*

## Curriculum Biology

### 1L Introductory Biology for Majors:

#### Cell and Molecular Biology Laboratory

Laboratory to accompany **Biology 1**. One laboratory per week for four hours. Must be enrolled concurrently in **Biology 1**. *Laboratory fee \$185 (includes lab manual).*

### 2 Introductory Biology for Majors:

#### Organisms and Evolution

This is the second semester of a course designed for biology majors and others requiring a rigorous introductory treatment of the subject. This course is a systematic introduction to all forms of life, covering all three domains: Bacteria, Archaea, and Eukarya. To account for life's unity and diversity, the guiding principle for the course is the concept of evolution. **Biology 2** builds upon the cellular and molecular foundation given in **Biology 1** (which is pre-required for **Biology 2**), and assumes knowledge of hereditary principles, both Mendelian and molecular. Through the study of the molecular evidence, morphology, physiology, development, and behavior of each type of organism, we provide a broad understanding of the evolutionary origins and phylogenetic relationships of all forms of life. Required for biology majors and prerequisite to ALL upper-division courses. Three hours of lecture per week. Must be enrolled concurrently in **Biology 2L**. *Prerequisites: Chemistry 8 and 9 (lab), 10, 11 (lab), Biology 1, 1L, with grades of C– or better.*

### 2L Organisms and Evolution Laboratory

Laboratory to accompany **Biology 2**. One laboratory per week for four hours. Must be enrolled concurrently in **Biology 2**. *Laboratory fee \$185.*

### 5 Concepts in Evolutionary Biology

This question-oriented course designed for non-majors explores how science works through an examination of the concepts of the theory of evolution by natural selection, which is considered to be the unifying theme of the biological sciences. Three lecture hours and one lab per week. *Laboratory fee \$185. Offered in alternate years.*

### 6 Heredity and Society

An introduction to the basic concepts and technologies of genetics as they apply to humans, and the ethical issues that arise as a result of the application of those principles. Students will engage these areas through lectures, discussion, guest presenters, videos and hands-on laboratory experiences. Intended for students in any major regardless of background. Six hours of lecture, discussion, and laboratory per week. An introduction to the basic concepts and technologies of genetics as they apply to humans, and the ethical issues that arise as a result of the application of those principles. Students will engage these areas through lectures, discussion, guest presenters, videos and hands-on laboratory experiences. Intended for students in any major regardless of background. Six hours of lecture, discussion, and laboratory per week. *Laboratory fee \$185 (includes reader). Offered in alternate years.*

### 7 Introduction to Biological Anthropology

Study of the variation and evolution of the human species and its place in nature. Molecular, Mendelian and population genetics serve as a basis to discussions of natural selection and how that affects biological and physiological adaptation. The emphasis of this course explores why we see broad variations among homo sapiens and how these variations affect humans in their life cycle, health and culture. Limited to anthropology majors or by consent of instructor. Three lecture hours and one three-hour lab per week. *Laboratory fee \$185. This course satisfies the Scientific Understanding requirement of the Core Curriculum.*

### 10 Introduction to Biology

Study of the chemistry of life, the organization of cell and the molecular processes inside of cells. This course emphasizes the genetic basis of life and includes an introduction to biotechnology. Designed for Kinesiology students as a prerequisite for microbiology, human anatomy, and human physiology. Three hours of lecture per week. Must be enrolled concurrently in **Biology 11**. *This course satisfies the Scientific Understanding requirement of the Core Curriculum.*

### 11 Introduction to Biology Laboratory

Laboratory to accompany **Biology 10**. Includes techniques for studying organic molecules, cell biology and genetics. One lab per week for three hours. *Laboratory fee \$175.*

### 12 Human Nutrition

This course is an overview of human nutrition. Concepts from biology, chemistry, biochemistry, anatomy and physiology are used to describe the nutrients and their function in the body. Focus is on the physiological need for food and promotion of healthy eating practices as they relate to optimum body function and disease prevention.

### 13 Human Anatomy for Kinesiology

Study of the gross and microscopic structure of the human body. This course emphasizes the structural relationships and functional aspects of gross anatomy, proceeds from the cell to tissues to organs. A strong high school science background is recommended. Three hours of lecture per week. Must be enrolled concurrently in **Biology 14**. Limited to majors in kinesiology or by consent of instructor. *Prerequisites: Biology 10, 11 (lab) and Chemistry 2, 3 (lab) with a grade of C– or better in both courses.*

### 14 Human Anatomy Laboratory

Laboratory to accompany **Biology 13**. Laboratory will be taught from virtual materials and models. One three-hour lab per week. Must be concurrently enrolled in **Biology 13**. *Laboratory fee \$175.*

**15 Human Anatomy**

Study of the gross and microscopic structure of the human body. This course, emphasizing the structural relationships and functional aspects of gross anatomy, proceeds from the cell to tissues to organs. A strong high school science background is recommended. Three hours of lecture per week. Must be enrolled concurrently in **Biology 16**. Limited to majors in allied health science, biology, biochemistry, or by consent of instructor.

*Prerequisites:* **Chem 8 and 9 (lab), 10 and 11 (lab)** with a grade of C– or better.

**16 Human Anatomy Laboratory**

Laboratory to accompany **Biology 15**. Laboratory will be taught from dissected human material, models and microscopic slides to allow students to learn from direct experience. One three-hour lab per week. Must be enrolled concurrently in **Biology 15**. *Laboratory fee \$185.*

**25 Human Physiology**

Study of the function of the major organs and organ systems of the human body. This course, emphasizing regulation and integration, proceeds from general cell function to an overview of the controlling mechanisms and finally to the individual systems. A strong high school science background is recommended. Three hours of lecture per week. Must be enrolled concurrently in **Biology 26**. Limited to majors in allied health science, biology, biochemistry, kinesiology, or by consent of instructor. *Prerequisites:* **Chem 8, 9 (lab); 10, 11 (lab)** with a grade of C– or better; OR **Bio 10, 11 (lab)** and **Chem 2, 3 (lab)** with a grade of C– or better.

**26 Human Physiology Laboratory**

Laboratory to accompany **Biology 25**. The laboratory consists of experiments and demonstrations designed to incorporate principles of physiology. One three-hour lab per week. Must be enrolled concurrently in **Biology 25**. *Laboratory fee \$185 (includes lab manual).*

**34 Protecting Biodiversity**

The primary goal of **Bio 034** (Protecting Biodiversity) is to introduce students to basic concepts of evolution, ecology and conservation in the service of protecting planetary biodiversity. The course will often focus on California, and how the natural history, ecology and issues within our state relate to topics elsewhere in the US and abroad. The information contained in this course will provide some of the intellectual tools necessary to understand the worldwide environmental crisis we are living through and perhaps some possible solutions. Students will be expected to develop a deeper appreciation for the intricacy and beauty of natural systems. Attention will be placed on honing the student's general knowledge of the scientific method through the laboratory and in-class exercises. *This course satisfies the Scientific Understanding requirement of the Core Curriculum.*

**40 Introductory Microbiology/Microbes**

Microbes are all around us. This course covers the biology of microbes including bacteria, viruses and fungi, with emphasis on the health impact of infectious diseases, vaccinations and antibiotic resistance. The use of microbes, both modified and unmodified, in biotechnology and food production are also covered. The importance of microorganisms in ecosystems ranging from lakes, oceans, soils and waste water treatment will also be explored. 3.25 hours of lecture per week. Must be enrolled concurrently in **Biology 41**. *This course satisfies the Scientific Understanding requirement of the Core Curriculum.*

**41 Introductory Microbiology Laboratory**

Laboratory to accompany **Biology 40**. Includes techniques for culture, isolation, characterization and identification of microorganisms. One lab per week for three hours. Must be enrolled concurrently in **Biology 40**. *Laboratory fee \$185.*

**50 General Biology**

A one semester introduction to the basic principles and concepts of biological science. Designed for students not majoring in biology. Three hours of lecture per week. Must be enrolled concurrently in **Biology 51**. *This course satisfies the Scientific Understanding requirement of the Core Curriculum.*

**51 General Biology Laboratory**

Laboratory to accompany **Biology 50**. One lab per week for three hours. Must be enrolled concurrently in **Biology 50**. *Laboratory fee \$175.*

**55 Oceanography**

An introductory course that examines the ocean world and its inhabitants. Topics include physical and chemical properties of sea water; tides and currents; geological principles; coastal and open ocean habitats; life in planktonic and benthic communities; coral reef, hydrothermal vent and mangrove ecosystems. Three hours of lecture per week. One lab per week for three hours. *Laboratory fee \$185.*

**80 Human Biology**

This is a course to connect basic biology concepts using the human as an illustrative example. Basic scientific processes and the concepts of human biology will be explored through lecture and laboratory exercises. Topics will include science and society, the chemistry of living things, structure and function of cells, genetics, anatomy and physiology of the organ systems, reproduction, cancer, aging, evolution, human impacts and environmental issues. Open to all students interested in discovering the scientific process and the concepts of human biology. One three-hour lab per week. *This course satisfies the Scientific Understanding requirement of the Core Curriculum.*

## Curriculum Biology

### 81 Human Biology Laboratory

Laboratory to accompany **Biology 80**. One lab per week for three hours. Must be enrolled concurrently in **Biology 80**. *Laboratory fee \$185.*

### 88 Biology of Women

Biology of Women is an introduction to the structure, physiology and genetics of women across the life span. The first half of the course will explore the genetic, hormonal and developmental basis of gender. We will study physiology and development from conception, through puberty, pregnancy and aging. The latter part of the course will deal with specific health concerns of women and focus on predominantly or uniquely gender-related illnesses and their physiologic basis. The laboratory is intended to demonstrate the varied processes of science and the scientific method using women's biology as the basic subject material. Open to men and women. *Laboratory fee \$185. This course satisfies the Scientific Understanding requirement of the Core Curriculum.*

### 89 Biology of Women Laboratory

Laboratory to accompany **Biology 88**. One lab per week for three hours. Must be enrolled concurrently in **Biology 88**. *Laboratory fee \$185.*

## UPPER DIVISION

*Each upper-division course has prerequisites of **Biology 1, 1L and 2, 2L** with a grade of C– or better in each of these prerequisites.*

### 100 Comparative Vertebrate Anatomy

The course examines vertebrate form and function through the topics of vertebrate evolution, functional morphology and development, along with the study of soft tissues, organ systems and skin. Three lecture hours and one lab per week. *Laboratory fee \$185. Prerequisites: **Biology 1, 1L and Biology 2, 2L.***

### 102 Developmental Biology and Embryology

This course explores the processes during embryonic development of animals, including fertilization, establishment of a body plan, organ and organ system development. The topics will be examined with an emphasis on mechanisms controlling cell differentiation and morphogenesis. Three lecture hours and one lab per week. *Prerequisites: **Biology 1, 1L and 2, 2L and Chemistry 104, 106.** Laboratory fee \$185. Offered in alternate years.*

### 105 Genetics

This course examines the principles of inheritance in animals, plants and microbes. Topics include classical Mendelian genetics and inheritance patterns, molecular understanding of DNA, RNA and information flow, and comparative genomics. These concepts are applied to the impact of genetics on the evolution of populations and the usage of genetics in medicine and technology. 3.25 hours per week of lecture and one lab per week for 4 hours. *Prerequisites: **Biology 1, 1L and 2, 2L.** Laboratory fee \$185.*

### 110 Parasitism and Symbiology

A comprehensive course in parasitology, focusing on the many facets of symbiosis common to every level of biology. It embraces the three basic types of intimate interrelationship between different species of organisms: parasitism, mutualism and commensalism. This course examines an array of interactions in all three types of interrelationships, at many levels of interdependency. All five kingdoms, from bacteria, protozoa and fungi to plants and animals, are studied. Three lecture hours and one lab per week. *Prerequisites: **Biology 1, 1L and 2, 2L.** Laboratory fee \$185. Offered in alternate years.*

### 113 Aquatic/Marine Biology

This course examines aquatic habits (freshwater and marine) around the world with a particular focus on California. Topics include the physical, chemical, biological and ecological processes that create, shape and transform aquatic habitats. In addition students will learn how to study these systems as well as learn to identify major groups of freshwater invertebrates within the systems. Three lecture hours and one lab per week. *Prerequisites: **Biology 1, 1L and 2, 2L.** Laboratory fee \$185. Offered in alternate years.*

### 115 Theory of Evolution

Historical development of evolutionary theories. Modern concepts concerning the process of organic evolution, including population genetics, natural selection and the origin of species. Topics on macroevolution, including adaptation and extinction. Three hours of lecture per week. *Prerequisites: **Biology 1, 1L and 2, 2L.***

### 116 History and Philosophy of Biology

Development of the major concepts of biology from antiquity to the modern era, with a consideration of what these developmental sequences show about the nature of the scientific process. Three hours of lecture per week. *Prerequisites: **Biology 1, 1L and 2, 2L.** Offered in alternate years.*

### 119 Research Design and Biostatistics

Principles of experimental design, sampling methodologies, data collection and analysis are discussed, along with practical applications of these areas in biological experimentation. Course includes use of computers. Three lecture hours and one lab per week. *Prerequisites: **Biology 1, 1L and 2, 2L.** Laboratory fee \$185. Offered in alternate years.*

### 120 Vertebrate Zoology

Advanced study of the vertebrates, with attention to phylogeny, morphology and natural history of the major vertebrate groups. Laboratory and field work emphasize taxonomy of local forms, methods of study and special projects. Three lecture hours and one lab / field period per week. *Prerequisites: **Biology 1, 1L and 2, 2L.** Laboratory fee \$185. Offered in alternate years.*



**122 Comparative Animal Physiology**

The functions of the major organ systems of vertebrate and invertebrate animals. Emphasis on general principles of function as exemplified in the major animal phyla.

Three lecture hours and one lab per week. *Prerequisites:*

**Biology 1, 1L and 2, 2L, Chemistry 104, 106.** Laboratory fee \$185. Offered in alternate years.

**125 General Ecology**

This course examines the science of ecology, why it is important, and how it is practiced with a particular focus on California. Topics include physiological, population, community, and ecosystems ecology. The course is designed to encourage students to think about ecological theories and their application to real world situations.

The lecture material and the lab require students to employ quantitative methods (i.e., math and statistics).

Upon completion of the course, students will have a rich appreciation for the way organisms and their environment interact and shape each other as well as the interconnectedness of nature. *Prerequisites:*

**Biology 1, 1L and 2, 2L.** Laboratory fee \$185. Offered every semester. This course satisfies the Writing in the Disciplines requirement of the Core Curriculum.

**127 Systemic Physiology**

Fundamental principles of general mammalian physiology combined with physiology of organ systems, including integrative and homeostatic mechanisms. Emphasis is on human physiology with examples taken from mammalian systems. Application of these principles to interpretation of disease is included. Laboratory includes human and mammalian experiments with emphasis on instrumentation and interpretation of results. Three lecture hours and one lab per week. *Prerequisites:* **Biology 1, 1L and 2, 2L, Chemistry 104, 106.** Laboratory fee \$185.

**128 Advanced Human Anatomy**

Study of the anatomy of the human body. This course is taught through a regional approach, emphasizing the structural relationships and functional aspects of gross anatomy, histology and embryology. References to the evolution of anatomic structure will be included. Extensive out of class dissections will be expected. This course is limited to Biology and Biochemistry majors. *Prerequisites:*

**Biology 1, 1L and 2, 2L.** Laboratory fee \$185. *Note:* Students who have taken **Biology 15, 16** are not eligible to take **Biology 128**.

**130 Microbiology**

An introduction to the growth, metabolism and genetics of microorganisms, with focus on bacteria and viruses. The application of fundamental knowledge about these organisms to ecosystems, biotechnology and infectious diseases is included. Laboratory involves the application of sterile technique to the study of taxonomy, physiology and genetics of bacteria and viruses. 3.25 hours of lecture and one 4 hour lab per week. *Prerequisites:* **Biology 1, 1L and 2, 2L, Chemistry 104, 106.** Laboratory fee \$185. Offered in alternate years.

**132 Cell Biology**

This course is designed to study selected areas of current interest in cell biology. Topics include fundamentals of cell structure, membrane structure and function, signal transduction and application to principles of cell biology to various processes such as embryonic development etc., and systems such as nervous system and immune system. Choice of topic varies. Emphasis is placed on experimental methods and answering the question "How do we know what we know?" Lab includes extensive exposure to cell culture methods. Three hours of lecture and one lab per week. *Prerequisites:* **Biology 1, 1L and 2, 2L, Chemistry 104, 106.** Laboratory fee \$185. Offered in alternate years.

**135 Biochemistry**

An introduction to protein, lipid and carbohydrate structure and function, metabolism of proteins, lipids, and carbohydrates and coordination of biochemical processes for normal functioning of the body. Consideration is given to the properties of enzymes and enzyme catalyzed reactions in the cell. Applications to human function, disease and diet are included. Three hours of lecture and one lab per week. *Prerequisites:* **Biology 1, 1L and 2, 2L, Chemistry 104, 106.** Laboratory fee \$185.

**137 Molecular Biology**

An introduction to the structure and function of the genetic apparatus. This course is a study of what genes are and how they operate, and includes recent discoveries in the areas of DNA, RNA and protein synthesis in both prokaryotes and eukaryotes. Laboratory includes both discussion and practice of techniques used in genetic engineering. Three hours of lecture and one lab per week. *Prerequisites:* **Biology 1, 1L and 2, 2L, Chemistry 104, 106.** Laboratory fee \$185.

**139 Immunology**

An introduction to the immune system: its components, how it functions, how it is regulated and how it is protective. The immune response and our ability to react to such a diversity of molecules with specificity are discussed in detail. In addition, the immunologic basis for tissue /organ transplant rejection, disease prevention vaccines and cancer immunotherapy are presented. Three hours of lecture and one lab period per week. *Prerequisites:* **Biology 1, 1L and 2, 2L, Chemistry 104, 106.** Laboratory fee \$185.

**142 California Flora and Communities**

Survey of selected plant communities of California. Includes a dual emphasis on field recognition of important plant families and genera of these communities and an understanding of the relationship of the component species to their environment. Labs are five weekend field trips. *Prerequisites:* **Biology 1, 1L and 2, 2L** or by permission of instructor. Laboratory fee \$185. Offered in alternate years.

## Curriculum Biology

### 144 General Botany

The study of plant biology at an advanced level, including topics in the structure and development, reproductive patterns, taxonomy, identification, phylogeny, and distribution of major plant groups. Three lecture hours and one lab per week. *Prerequisites:* **Biology 1, 1L and 2, 2L.** *Laboratory fee \$185. Offered in alternate years.*

### 146 Plant Ecophysiology

The functional aspects of plant life and the relation of plants to their physical, chemical and biological environment. Emphasis on the vascular plants. Three lecture hours and one lab/field period per week. *Prerequisites:* **Biology 1, 1L and 2, 2L.** *Laboratory fee \$185. Offered intermittently.*

### 152 Conservation Science

Conservation biology is a field of biological science that draws upon the principles of ecology, genetics and evolution in an effort to understand the patterns and processes underlying the biological diversity of our planet. The course examines the current status of our scientific understanding of biodiversity, threats to biodiversity resulting from human activities, and strategies to conserve and restore the integrity of the earth's biological systems. Course activities include case studies, computer modeling and field trips. Three hours of lecture and one lab/field period per week. *Prerequisites:* **Biology 1, 1L and 2, 2L or permission of instructor.** *Laboratory fee \$185. Offered in alternate years.*

### 192 Special Topics in Organismal Biology

These are courses designed to explore specific areas within Organismal Biology. The courses offered in this area include topics such as Stem Cell Biology, Pathophysiology, Neurobiology, etc. *Prerequisites:* **Biology 1, 1L and 2, 2L;** *some topics may need additional prerequisites.*

### 193 Special Topics in Cellular and Molecular Biology

These courses are designed to explore specific areas within Cellular and Molecular Biology. The courses offered in this area include topics such as Virology, Metabolic Biochemistry, etc. *Prerequisites:* **Biology 1, 1L and 2, 2L;** *some topics may need additional prerequisites.*

### Bio 194 Special Topics in Evolution and Ecology

These courses are designed to explore specific topics within Evolutionary Biology and Ecology. The courses offered in this area include topics such as Animal Behavior, Biology of Fishes, Primate Adaptation and Evolution, etc. *Prerequisites:* **Biology 1, 1L and 2, 2L;** *some topics may need additional prerequisites.*

### 197 Special Study

An independent study or research course for students whose needs are not met by courses available in the regular offerings of the department. *Permission of the instructor and the department chair required. Laboratory fee, when appropriate, \$185.*

### 199 Special Study — Honors

An independent study or a research course for upper-division majors with a B average in biology. *Permission of instructor and department chair required. Laboratory fee, when appropriate, \$185.*